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Indestructive Technique for Elastic Uniaxial Stress of Monocrystals

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The original technique for a strong uniaxial elastic compression of moncrystals up to 5 à 6 kbar is described. It permits to avoid difficulties in mounting and frequent destruction of samples that are characteristic for conventional methods of uniaxial compression between two anvils. In the technique under consideration a sample in the form of rectangular parallelepiped is firmly fastened with the help of polymerized epoxy in an elastic steel ring along ''x'' direction, and afterward a tensile stress is to be applied to the ring in ''y'' direction. The ring transforms a tensile stress into the compressive one, applied to the both ends of the sample in the plane of the ring. Axial distribution of stress in the ring and a solid junction secure the sample of a premature destruction. Moreover, in the case if the plastic deformation of a monocrystal develops by a sliding process, the fixation of the main cleavage planes of the crystal inside the ring moves the plastic flow limit away until it starts developing along the not supported secondary cleavage planes. Advantages and possibilities of the technique are illustrated by some experimental results obtained in the system of Bi_xSb_{1-x} alloys and in p-GaAs/Al_xGa_{1-x}As heterostructures.

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Controlled-temperature diffraction experiments on samples in glass capillaries

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The measurement of samples in glass capillaries has advantages for certain types of materials, for instance samples with anisotropic crystallite shapes or crystallites in liquids. With the introduction of multi-purpose X-ray powder diffractometers, the capillary technique has become a standard addition to the conventional Bragg-Brentano reflection geometry. For controlled temperature experiments, however, the reflection geometry is still mostly used, especially in the case of low-temperature measurements. In order to obtain a controlled-temperature device for capillary powder diffraction, a Cryostream (an established product in the single crystal community) has been modified, in close collaboration between Oxford Cryosystems and PANalytical. Key question in this integration is of course the accuracy of the sample temperature along the capillary length. In this study, we determined the temperature accuracy of the Oxford Cryostream for this powder diffraction application and show an example of what can be done with this capillary heater-cooler.